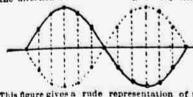
THE WONDERFUL LIGHT. WHAT LIGHT IS ACCORDING TO THE MODERN THEORY.

Faraday's Beginnings - Maxwell's Great Trentise The Brilliant Discoveries of Heriz - The Observed Facts and the Hypotheses in Rocatgen Discoveries,

The strange photographic effects which Rontgen has discovered bring the public again face t. face with the modern theory, the electro-magnetic theory, of light, a theory of which Faraday was the prophet, Clerk Maxwell the framer, and Hertz the demonstrator.

The wave theory of light was established early in this century by Young and Freenel. This theory declares that all space through which light travels is filled with a medium, to which the name luminiferous ether, or simply ether. is given, and that light passes through this medinm by means of transverse waves; that is, waves of such a character that the motion of the particles of the ether transmitting the light is everywhere at right angles to the direction in which the light is trevelling.



This figure gives a rude representation of the idea. The dots on the straight horizontal line represent particles of the other which are in their natural undisturbed condition. The dots on the black curved line represent the same particles at a certain instant while a wave of light is moving through their region of space. In the direction indicated by the arrow. An instant later the same particles will be in the poaition indicated by the heavy dots on the other curved line. The particles merely move back and forth on the dotted vertical lines, as the

successive waves pass them.

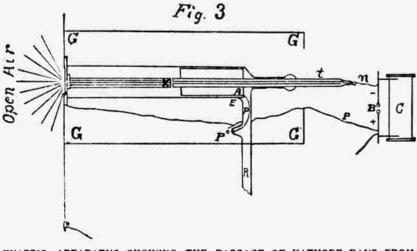
Before the time of Faraday the attractions and repulsions of magnetized and electrified bodies were well known, but Faraday undertook to explain these effects by means of a medium which he believed to fill all space where magnetic and electric actions occur. He

and there are many such, should pender these sentences, in which Maxwell cautiously sets forth a great thought which the later course of science has confirmed as a great truth.

"But the properties of bodies are capable of quantitative measurement. We therefore obtain the numerical value of some property of the medium, such as the velocity with which a disturbance is propagated through it, which can be calculated from electro-magnetic experi-ments, and also observed directly in the case of light. If it should be found that the velocity of propagation of electro-magnetic disturbances is the same as the velocity of light, and this not only in air, but in other transparent media, we shall have strong reasons for believing that light is an electro-magnetic phenomenon, and the combination of the optical with the electrical evidence will produce a conviction of the reality of the medium similar to that which we obtain, in the case of other kinds of matter, from the combined evidence of the scases."

The theories of Maxwell gave inspiration and direction everywhere to investigation of electro-magnetic effects and their relations to light, and even before his death, in 1870, advanced students had accepted the electro-magnetic theory of light. Maxwell's work found recognition in Germany largely through the influence of Helmholtz, who declared that he had tried in vain to grasp Faraday's idea of lines of force till Maxwell put it into mathematical form. Helmholtz had for a pupil and assistant Hermann Hertz. who was, fifteen years ago, a quiet, thoughtful young man, engaged at the Berlin Physical Laboratory in putting to nature ingenious and searching questions which she up to that time had answered mainly in the negative. But, stimulated and advised by Helmholtz, he continued. and some years later astonished the world by a series of brilliant discoveries and researches which crowned with glory the few remaining years of his too short life, and established bemagnetic theory of light.

The ether waves known before the discoveries of Hertz were so short as to be measured in hundred thousandths of an inch, and it was impracticable to get direct proof of their electromagnetic character. The waves which Hertz discovered were many feet in length. They were produced by electrical means, and they gave electrical effects. They were undoubtedly electro-magnetic waves, but they were reflected showed by experiment that the attractions and | like ordinary light waves, they were refracted repulsions in question are at least affected by like ordinary light waves, and they travelthe interposition of various substances between led with about the same velocity as ordithe charged or magnetized bodies, and he in-



LENARD'S APPARATUS SHOWING THE PASSAGE OF KATHODE RAYS FROM A VACUUM TUBE TO THE OPEN AIR THROUGH A SHEET OF ALUMINIUM.

From Wiedemann's Annalen for January, 1894.

is an induction coil, shown on a smaller scale than the rest of the apparatus. Is a wire leading from the negative pole of the coil through the small glass tube f to the kathode, K, a disk

of aluminium.

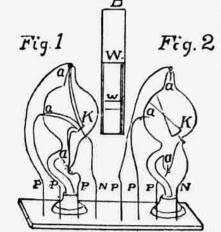
P is a wire leading from the positive pole of the coil through the wall of the tube R to the brass tube A A, which is therefore the anote.

E E is a giast tube, containing both K and A A, from which the air is exhausted to any desired extent through the tube R, which leads to an air pump.

At the left hand e id of the tube E is a small hole covered by a thin sheet of aluminium. This is the "window" through which the kathode rays, extending in straight lines from K, enter the air.

The metal case G G G G prevents light of the ordinary kind from reaching the "observation space" beyond the window.

vented and made much use of the term "lines of force," now so familiar in electrical science. He went a step further and expressly con-nected his idea of an electro-magnetic medium with the idea, already familiar, of a luminiferous medium. He wrote in 1851 as follows: "For my own part, considering the relation of a vacuum [a space empty of air, but containing, according



bulb like this right-hand one was used by Prof. whridge to obtain the effect, Jan. 29, but the alter-

to him, the electro-magnetic medium] to the magnetic force, and the general character of magnetic phenomena external to the magnet, I am more inclined to the notion that in the transmission of the force there is such an action, exter: at to the magnet, than that the effects are merely attraction and repulsion at a distance. Such an action may be a function of the ether; for it is not at all unlikely that, if there be an ether, it should have other uses than simply the conveyance of radiations [that is, light]."

Faraday, however, was not a mathematician. seemed vague and unsatisfactory. But Lore Kelvin, then plain William Thomson, saw some thing of value in them, and his opinion pre valled upon Clerk Maxwell, a young Cambridge man, to make them his serious study. Highly nevertheless began the study of electricity with the resolution to read no mathematics on th subject till he had first read through Faraday's Experimental Researches on Electricity.

Toward the end of his great treatise on electricity and magnetism, which is still the treatise although it is twenty-three years old, Maxwell segins an immortal chapter with these words 'In the several parts of this treatise an attempt has been made to explain electro-magnetic phenomena by means of mechanical action transmitted from one body to another by means of a medium occupying the space between them. The undulatory theory of light also assumes the existence of a medium. We have now to show that the properties of the electro-magnetic medium are identical with those of the lumi-niferous medium. * * * To fill all space with a new medium whenever any new phenomenon is to explained is by no means philosophical, but if the study of two different branches of science has independently suggested the idea of medium, and if the properties which must be attributed to the medium in order to account for electro-magnetic phenomena are of the same niferous medium in order to account for the phenomena of light, the evidence for the physical existence of the medium will be considerably

The most impressive word in this impressive passage is, under the circumstances, the word considerably." l'eople who cannot distinguish between what they guess and what they know,

essentially the same. To put the matter into a crude form, a form which contains only a part

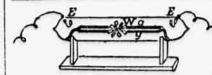
of the truth, and gives, perhaps, only a very im perfect idea of that part, we may say that the particles which are represented as vibrating back and forth across the path of the light ray in Fig. 1 are particles of electricity, forming one element of, not the whole of, the ether This is the electric aspect of the electro-magnetic theory of light. No attempt will here be made to represent the other, the magnetic as-The oscillations of the electric particles to and fro in their restricted paths may be regarded

same sense in which the oscillations of the mercury in a disturbed barometer may be regarded as alternating streams of mercury. Electric currents of this restricted kind are called "displacement currents," and they are supposed to take place in substances which are not conductors of electricity in the ordinary sense, in glass, for instance. The electricity is supposed imprisoned in glass, but not entirely motionless. It can move the length of its chain or, rather, of its elastic bonds. Sometimes the prisoner becomes too powerful, the In a so-called conductor, like copper or any

metal, the electricity moves with great freedom; not with perfect freedom, for there is something analogous to friction, which is called resistance, but without anything of the clastic bond restraint. After it moves it has no tendency to return to its original position. So. when a beam of light, conveyed through the ether by means of short transverse "displacement" currents of electricity in the other strikes upon a metal surface it sets up at this surface. and for a very slight distance within it, an electric current which is something more than a "displacement" current. It is a real current, transverse to the course of the ray still, but the elastic, oscillatory character of the movement is lacking. There is no power of recovery, no elastic action upon particles deeper in the metal, and so the light falls, absorbed and turned into mere heat by the too ready yielding of the electricity within the metal. good conductors of electricity are bad conductors of light, although light is propagated by electric movements. This is a paradox over which many have stumbled.

But we can see no reason why the ether should not maintain also vibrations like those of air conveying sound. This figure will give some no-

tion of such an action. The dots represent particles of air, which are equilistant from each now out of position, so that they are crowded Each particle swings back and in the line of



Tube for showing the mee' spical effect produced by discharge in a Crookes action tube. Wis a light which with vanca of mica which can roll along on the glass rile g. E and E are the electrodes. The wheel is driven away from the kathode toward the anote.

travel of the sound, indicated by the arrow Such vibrations are called longitudinal vibra-tions. They bring into play a different kind of elasticity from that which maintains transverse vibrations, and may exist where transverse ibrations cannot exist. Longitudinal electric vibrations might exist in all kinds of substances conductors or non-conductors. It seems alto-gether likely that such vibrations do exist in he ether, and that they transmit their peculiar kind of disturbance with a velocity enormously greater than the velocity of light. It is said that Rontgen suspects his newly discovered "rays" maintained by longitudinal vibrations

This hypothesis will be discussed later. The matter now in print concerning Rontgen's phenomena may be divided into three classes. First, facts, or supposed facts, of observation or

history; second, hypotheses as to the nature of the action; third, pure inventions. The observed

facts appear to be: (a) That the so-called rays are sent out from the kathode of a vacuum tube, excited by a powerful alternating or rapidly interrupted cur-

rent of electricity.

(b) That these "rays" act readily through wood and flesh, less readily through metals, except the lightest of metals, aluminium, and hardly at all through ordinary glass.

(c) That the "rays" are not perceptibly re-

fleeted or refracted. (d) That a medium, a solution of lodine, which absorbs the short ultra-violet rays, does not allow the Röntgen influence to pass, and a medium, a solution of alum, which absorbs long waves, does allow the Röntgen influence to pass. This is from Mr. Swinton, an English experi-

(e) That the "rays" are not affected by the magnet.

The hypotheses are:

(a) That the "rays" are propagated by vibrations of greater length than those of ordinary light. Against this hypothesis we must put the experiment of Mr. Swinton, just alluded to.
(b) That the "rays" are ultra-violet rays.

But ultra-violet rays are called such merely because they are refracted more than the violet rays, which are themselves the most refrangible rays of the visible spectrum. As the Hönt-gen "rays" are apparently not refracted at all, it is difficult to see how they can be ultra-violet

(c) That they are rays of longitudinal vibra-tion. The possibility of such vibrations has been briefly discussed above. It is hard to see how they would differ essentially from the electric oscillations, or displacement currents, set up in the space between the plates of an electric condenser, a Leyden jar, for instance, when the charge upon the plates is rapidly reversed. Therefore it seems that we already know some-thing about the behavior of such vibrations, and there seems to be no reason whatever why 'rays" propagated by such vibrations should not pass with great readiness through giass. But the Röntgen "rays" act through ordinary class with great difficulty, and it is very doubt ful whether they can be explained by means of longitudinal vibrations.

May we not, then, ask whether the Röntgen

effect passes through wood, or flesh, or any other opaque material, in the form of rays at all? Leenard's rays may not be just like Rontgen's, but they appear to have much in common, and the figure given by Leenard, here reproduced, shows the little "window" of alumi-nium as a centre of radiation, not transmitting the rays as glass would transmit light, but rather radiating, as if itself the source of the vibrations proceeding from it. Now this is the kind of effect we obtain by fluorescence, when uranium glass, for instance, excited by ultra-violet rays, gives out radiations peculiar to itself, radiations of green light. It does this without being hot, and it is only one of many substances doing the same kind of thing. Is it not possible that the Röntgen effect is a fluorescent effect, to which wood and flesh and certain other opaque substances are peculiarly susceptible? If this surmise should prove to be true, distinct, sharply outlined effects upon the photographic plate are not to be hoped for, unless the un-susceptible body, the interposed bit of ginss, for instance, is close to the plate. This suggestion as to the fluorescent character of the Röntgen effect is given here as a suggestion merely. If Prof. Neusser of Vienna has located calcareous deposits in the organs of a living body by the Rönigen process, the fluorescence hypothesis here advanced is entirely untenable. The report says, however, the organs of a "subject," which probably means a dead and dissected body,

It was the good fortune of the writer to witness, a day or two ago, the first thoroughly successful attempt made by Prof. Trowbridge of Harvard with the new photography. One of the flyures included here is a fac-simile of the Crookes tube, or bulb, which he used on that occasion. It is now defunct, having expired in the cause of science. The other figures are of ossible interest to the public, as indicating ome of the remarkable phenomena long since CAMBRIDGE, Jan. 31. EDWIN H. HALL.

THE NEW PHOTOGRAPHY.

Photographing Through Opaque Bodies with an Ordinary Light. Special Cable Deepatch to Tun SUN. LONDON, Feb. 1.-Rapid strides are made almost daily in the development of the new photography. This week it has been used successfully to detect and locate gall stones in a pa-

tient's liver and stone in the bladder. It was announced in the French Academy of Sciences on Wednesday that it would be possibodies with ordinary light. A kerosene lamp will do it. M. Lebon asserts that he has taken photographs in this manner for several years.

He proceeds as follows: Inside a box with rather thin sides he places a sensitized plate. Behind the negative in front of the box he places an iron plate, and on the other side of the plate a lamp. After three hours' exposure an image is found. On development, this image is indistinct, but if a sheet of lead be placed behind the box and rolled over to touch the iron plate so as to form a metalic shell, the reproduction of the negative for the same length of exposure is quite distinct. This experiment cannot be ac-

counted for on existing theories.

M. Lebon has ascertained that the image is not due to any phosphorescent light which might have been stored up in the negative.

The experiment will not succeed if heat rays

MADIGAN HAD NOT REFORMED. A Former Convict Accused of Robbing a Kind Employer.

About two months ago David K. Sherman, a wholesale cattle dealer at the Central stock yards in Jersey City, employed Herbert Mudigan of 335% Ninth street, Jersey City, as bookkeeper. Madigan was competent and attentive to business, and soon won Mr. Sherman's confidence. Two weeks ago Mr. Sherman gave to Madigan \$113 to pay off the employees. Long after the time to quit work Mr. Sherman saw the men lounging around, and asked them what they were waiting for. They said they had not been paid.

No trace of Madigan could be found for sex-

No trace of Madigan could be found for several days. Finally a relative of Madigan called upon Mr. Sherman and told him that Madigan alled upon Mr. Sherman and told him that Madigan had appropriated the money, but that his friends would make it good. Mr. Sherman waited a few days and then notified the police, who arrested Madigan.

The prisoner is an old offender, so the police allege. They say he began stealing when he was a boy and progressed in the profession when he was not in fail until he robbed a safe. Then he was sent to State prison for five years.

Then he was sent to St-te prison for five years. His picture is 543 in the Rogues Gallery. Madi-gan was arraigned before Police Justice Pots yesterday morning and committed for trial.

POCKETED 'BUS FARES. An Elderly Man Arrested for Stealing in a Fifth Avenue Stage.

The Fifth Avenue Stage Company's officials have been aware for several weeks that some one was robbing them of small sums of money. Several of the stage drivers were suspected, and they were watched closely, but without reault. On Friday afternoon Inspector John P. Veville was on the rear of a crowded stage, when a respectable-looking man about 50 years old got aboard at Fighteenth street.

He pushed his way up to the front of the stage, and stood in front of the money box. An elderly woman took a nickel from her purse and handed it to the man, sayling:

"Won't you please drop my fare in the box?"

"Certainly," he answered as he touched his hat. He turned around and put his hand over the slot of the money box, but didn't drop in the nickel. Inspector Veville watched the man until he saw him pockel several more nickels in the same way. Then he had him arrested.

The prisoner refused to give his name or address in Jefferson Market Court yesterday morning, and demanded an examination. Several of the stage drivers were suspected.

The Dinner to Richard Croker. At the dinner to be given in honor of Richard Croker at the Hotel Savoy next Saturday an Croker at the Hotel Savoy next Saturday an engrossed memorial, reciting the many victories which were won for Tammany under the leadership of Mr. Croker, will be presented to him with the \$2,900 loving cup. Hesides the seventy members of the Tammany Executive Committee and the Tammany Hall Senators there have been invited as guests ex-Goy. Flower, ex-Mayors Grant and Gilroy, Comptroller Fitch, District Attorney Fellows, J. Sergeant Cram, Justice Frederick Smyth, John D. Orimmins, and Ass Bird Gardiner.

NEW LIGHT AND SURGERY.

New York's Best Surgeons in Doubt as to the Exact Value of the Light in Their Work-It Has Great Possibilities-What It May Do for Medical Practice,

What It May Do for Medical Practice.

Prof. Roentgen's newly discovered light, which penetrates paper, wood, flesh, aluminium, and some other metals, and makes possible the photographing of some objects through them, has caused more talk among the great physicians and surgeons of the world than any other discovery in recent years. The point discussed is what will be the advantage of the new light to the profession, and it is agreed generally now that as at present developed it will not be of nearly so great value as at first glance and first thought it would appear to be. A reporter for THE SUN talked with several of the best surgeons in this city hast week about the possibili-ties of the new light. They all agreed that the discovery was a great one, but they differed somewhat as to its utility. Too little, however, is known in this country on the subject to enable anybody to say exactly what are its possi-

"The new light, according to all that has been cabled to this country," said one surgeon "makes possible the photographing of the human skeleton, and that is all. For instance, a hand has been held up and the bones in it have been reproduced, the light passing through the flesh and tissue, there appearing no trace of either on the picture. It was as if all the fiesh had been removed and the bare skeleton of the hand held up to the camera and reproduced. It will be seen that this could be of slight advantage to a surgeon. Everything that can be known about the bones of the human frame is known. No picture could tell anything about them that we do not know. If one of them is misplaced or injured there are better means than photography for telling it to the surgeon. It has been said that it would photograph the brain, but that cannot be. It would photograph the skull, but the rays do not penetrate beyond the bone; they picture the bone itself

"By means of this light, I have read, we might be able to photograph a bullet in a hu-man body, and by that means we could locate the exact position of the bullet and would be able to operate to remove it more intelligently. There would be less chance of a mistake than there is now, that is to say, if the bullet was not hidden by the bones and in such a position that the rays of light would not be obstructed. In a case of this kind the new photography would be of very great value indeed. But if it happened that the bullet was imbedded in the head in the region of the brain, for instance, it would be of no value because it would be behind the skull and would not be pictured. However, there is scarcely any use in discussing it yet, for the discovery is in its infancy. It has not been developed sufficiently. It is a wonderful thing, and we cannot tell what still more wonderful

developed sufficiently. It is a wonderful thing in all we cannot tell what still more wonderful things it may lead to. It does not mark by any common a revolution in surgery; it is merely another one of the gizantie strides that the science of surgery has been taking in the past ten years. A few years ago we knew practically nothing it is hardly not twenty years has been greater than in all time before the common than in all time before the things of the country; that was by Prof. Trowbridge, direct to of the defferson physical laboratory at Harvard College, the other day. He obtained a discovering the past-beard. This experiment, showed condition in the things of the past-beard. The experiment showed condition in the Vicana University, showed by means of photographs the presence and position of calcarcous deposits in the bladder, directed and that Dr. Neusser, prefessor of medicine in the Vicana University, showed by means of photographs the presence and position of calcarcous deposits in the bladder, directed the great value of the new light in one direction. It may have still greater value in others. Of course, we have means already of discovering the presence of such deposits in the organic many conditions of calcarcous deposits in the bladder, it is the plays can were called to examine her. One man diagnosa due to examine her the word of the control of the presence of such deposits in the special many the presence of such deposits in the organic many the substances in the liver. It is was stone an operation could be performed, it was a case of cancer and resulted, as I had predicted, in the death of the word of the control of the presence of the liver. The other words may be a substance of the liver of the liver of the presence of such deposits in the organic many the presence of such deposits in the organic many the presence of such deposits in the organic many the presence of such deposits in th

Are operations of the kind you speak of performed on suspicion?"

"Certainly not. Operations are not performed on suspicion, but there is sometimes, as there was in this case, a possibility of mistake. If the physician who was consulted had not been certain in this case of his diagnosis, the surgeons would not have performed the operation. It is a fact that sometimes an operation is performed for one thing and something altogether different is found. Often it is something altogether different is found. Often it is something in addition to the thing for which the operation was proposed."

Another surgeon said:

"The new photography is valuable as it is developed at present to locate certain foreign substances in the body. I do not see of what other use it can be in its present state. That alone. I may say, is a very great thing."

"Have you not the means at present of exploring the human body?"

"We have, but not such good means. We can light up any of the cavities of the body, the stomach, for instance. We light that up with an electric light it of discover cancer and froubles of that nature. How do we do that? The patient swallows an electric light, it is, of course, properly protected. There is no heat that might burn."

"When the light is there how do you see?"

tient swallows an electric light. It is, of course, properly protected. There is no heat that might burn."

"When the light is there how do you see?"

"Just the same as you see through your hand, When you hold your hand before a strong light you see the light shining through it. When the light is in the stomach we can see by looking through the flesh. We can tell by the color and shape of things that should not be there what they are and can treat the patient accordingly or operate on him accordingly. We light up all the cavities of the head, the ness, the throat. So, too, we light up the bladder. We are enabled to see in these latter instances by glasses and multitudinous reflections. Then there are means of locating the position of foreign bodies in the human body. Take a builet, for instance; there is a telephone system that tells us where that builet is. It is a long, line needle, and is inserted in the wound. It moves along until it touches metal and then it telephones back and a bell rings. We know then exactly where the builet is and can operate and extract it. This is valuable, of course, only when the builet is in a position where the bellet phone needle can touch it. The Roentgen light promises great things, indeed. It will light up parts of the tody that we have not yet been able to light up, but we must not be too sanguine and must not be disappointed if it does not do quite so much as has been predicted. It may be, as in cases of other wonderful discoveries, overestimated, yet wonderful nevertheless."

Another surgeon who was seen said he did not want to discuss the new unctography, but said he had concluded from what he had read that it was one of the end-of-the-century wonders. "Its value, it appears to me," he said. "lies in its inture development rather than in its present achievement. It is a step full of great promise and, as I look at it, of little present value. I would not be surprised if it should be simply incalculatile. It is hard to see how this can ever be for if the rays penetrate th When the light is there how do you see?"

"What is it about?" asked the superintendent.

I want to ask him some questions about the new ight and new is tography discovered by Prof. Roentgen." said the reporter.

New light, new light?" said the superintendent testily. "No, we don't use it here. We list use plain gas and electricity."

This display of intelligence took the reporter tomewhat by surprise.

"Surely," he said. "you have heard of this."

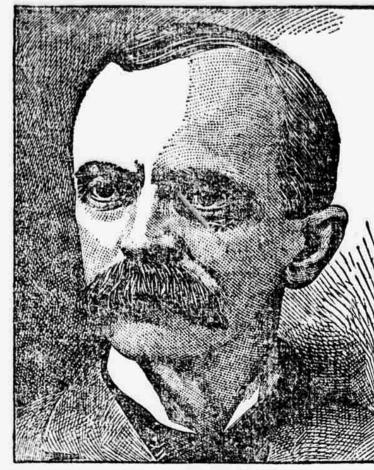
This discovery makes it.

NEW LIGHT AND SURGERY.

USES OF ROENTGEN'S DISCOVERY IN OPERATING ROOMS.

New York's Best Surgions in Doubt as to

Finds in Paine's Celery Compound the Greatest of All Remedies.



President Charles Dole is not the first great college President or great educator who has been outspoken in praise of Paine's celery com-

ently, as silhouettes. Assuming that the bones are, as described, opaque to this current, we do not see that the new photography can be very largely applied in surgery, since it could not detect the presence of nullets in the brain, and it would evidently be avery confusing and difficult mast to photograph a bullet in the thoracic or abdominal cavity, where the bony surroundings would cut off the larger part of the rays of light. However, the discovery is still in its infancy, and it is possible that modifications of the process may be made which will be of immense service in surgery and medicine."

The Record also has a letter from Vienna which says: ich says: Prof. Exper favored the Imperial Medical Association with a demonstration of the results already published by Prof. Reentger. The principle involves the utilization by photocraphy of the kathodal rays emitted from a feissler tube. Roentgen found that these rays (named by him 'X-rays'), invisible to the human eye, possessed also the properly of transmission through some solid objects, such as most appear and a few ments, while they were man eye, possessed also the paner; you has
mission through some solid objects, such as
wood, paper, and a few metals, while they were
intercepted by others. The interposition
of a sheet of paper was without effect;
a slightly perceptible interruption was produced by a playing card; a plain diminution of intensity followed the intervention of a
pack of playing cards, but a book of one thousand pages did not entirely absorb the kathedal
rays. The rays also passed, in user, through
a sheet of aluminium one and enc-half ceutimetres in thickness, and this metal was found
to possess greater transmissibility than class,
calespar, or quart. Exper exhibited a photographic plate, upon which, after exposure to the
X-rays, were shown the outlines of a Stemeoselement, enclosed during the process of photography in a wooden hox. The great pessibittles of the discovery were revealed by a
photograph of the bony skeleton of the living
human hand, with a finger ring, but without

the soft tissues. Roentgen advances to that the X-rays are longitudinal, re-ether waves, and not transverse, as

hand, with a finger ring, but without tissues. Roentgen advances the theory

markable.

He succeeded in photographing through wood an inch in thickness by the ether waves set up by a simple static electrical machine. Prof. Dolbear published the theory on which his remarkable results were based in the science department of a monthly magazine in April, 1894, under the heading "Electricity and Pho-

tography." Risarticle said:
"For a long time it was believed that there were three different kinds of ether waves, were three different kinds of ether waves, known as heat, light, and actinic rays. The latter were supposed to be the ones that produced the chemical action on photographic plates, while light consisted of rays of a different kind, capable of affecting the eye, it was discovered, however, that the same rays that can produce vision can heat a body and also do photographic work, and of matter it falls upon. All rays have similar characteristic properties.

This discovery makes it plain that there is no peculiar kind of ether waves which can be called "light" as distinguished from other

"Ob. yes." interrupted the superintendent.
"You mean the new Welshach light; no, we don't use it here. No use seeing him about it."
The reporter departed in wonder.
The Medical Record this week says editorished the words which can be peculiar kind of ether waves which can be called "light" as distinguished from other kinds of ether waves. What is called light is simply a physiological phenomenon, and has no existence spart from eyes. So well assured is

exists) of the remarkable power of Paine's cel-

waves.

WAS AREAD OF ROENTGEN.

Prof. Dolbear Wrote of the New Photography in 1894.

Boston, Feb. 1.—Prof. Rontgen is, perhaps, the last of the army of inventive genius who find, after their laborious investigations are brought to a successful conclusion, that there is "nothing new under the sun."

A Sun reporter, in conversing to-day with Prof. A. E. Dolbear, the noted physicist of Tufts College, regarding the recently published experiment in photographic published experiment in photography is the same agent, and had obtained resuits quite as remarkable.

He successeded in photographing through

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Tof. Dolbear were unoved and given to the world in May, 1892, by Prof. Ioblear, though first recentled in mubble print in April, 1864. It will also be noted that Prof. Bolbear, though first recentled in mubble print in April, 1864. It will also be noted that Prof. Bolbear, though first recentled in mubble print in April, 1864. It will also be noted that Prof. Bolbear, though first recentled in mubble print in April, 1864. It will also be noted that Prof. Bolbear, though first recentled in mubble print in April, 1864. It will also be noted that Prof. Bolbear, though first recentled in mubble print in April, 1864. It will also be noted that Prof. Bolbear, though first recentled in mubble print in April, 1864. It will also be noted that Prof. Bolbear, though first recentled in mubble print in April, 1864. It will also be noted that Prof. Bolbear, though first recentled in mubble print in April, 1864. It will also be noted that Prof. Bolbear, though first recentled in mubble print in April, 1864. It will also be noted that Prof. Bolbear, though first recentled in mubble print in April, 1864. It will also be noted that Prof. Bolbear, though first recentled in mubble print in April, 1864. It will also be noted that Prof. Bolbear, though the selection in the test of an ordinary state clerk in the atmosphere, and in perfect darkness.

Total also be nearly that Prof. Bolbear, though the minutes.

On examining the sensitive paper it was seen to have grown darker by exposure to the rays electrically set up by the macaine, and to bear a dim outline of the star. It was then developed the star of the details of the

aged in the ordinary way, and the details of the fran object were distinctly brought out. The "intensity of the negative at such experi-ments varies ordinarily with the time of the This experiment was made in May, 1862. It was done without the aid of a Creekes tube by

sporking by rapidly rotating the glars disk.

This is the source of light with which Prof.
Delbear made his discovery. The Crookes tube
is named from its inventor, It has been variously described as "cylindrical" and "egg

Sleeplessness, usually due to an abnormally excited, overworked, but underfed brain, vanishes with the coming of a rich tide of nourishing blood.

exists) of the remarkable power of Faine's celery compound to make the sick well again.

President Dole was born in 1843. He graduated from Norwich University, in the class of 1850, and became Professor of Political Science in the university. In 1865 he was unanimously elected President to succeed ex-Secretary of State the Hon. Georgo Nichols. He has held, as the public good required, nearly all the public offices in the gift of his townsmen. In a recent letter he says:

"I have used Paine's celery compound for several years and find it an excellent remedy for nervous exhaustion, especially that caused by long continued mental work."

It have used lover the bedy.

Its use is soon followed by an increase in the quantity of active, ruddy blood, quick in its rounds.

Dyspepsia, neuralgia, and rheumatism are rousel from the body. Diseases due toderanged, underfed nervous tissues are rapidly cured, and good spirits, hopefulness, and an eagorness to get well take the place of melancholy, low spirits, morose temper, and the fear of approaching calamity, that are the shadows of a rundown nervous system.

Nerve-tired, overworked, but underfed brain, vabilishes with the coming of a rich tide of nourishing blood.

As soon as the spent nerves have been made at one of the feeling of exhaustion, the public good subtite on the feeling of exhaustion, to pain in the back and sides that foretell kidness of pains in the back and sides that foretell kidness of pains in the back and sides that foretell kidness of pains in the back and sides that foretell kidness of pains in the back and sides that foretell kidness of pains in the back and sides that foretell kidness of pains in the back and sides that foretell kidness of pains in the back and sides that foretell kidness of pains in the back and sides that foretell kidness of pains in the back and sides that foretell kidness of pains in the back and sides that foretell kidness of pains in the back and sides that foretell kidness of pains in the back and sides that foretell kidness o

this that the serious proposal is made to banish the word "light" from physics.

"The sensitive coating upon a photographic plate is an unstable chemical compound, which may be broken up by mechanical pressure, by heat, or by ether waves. The proper wave length for a given plate depends upon the nature of its surface. The tenning of the skin, the darkening of newly-had shingles, the coiring upon apples and other fruits, is a photographic process, as can be shown by shielding traphip process, as can be shown by shielding them from the sun's rays. It has long been known by hotographers that pletures may be known by photographers that pletures may be known by hotographers that pletures may be known by photographers that pletures may be known by photographers that pletures may be known by hotographers that pletures may be known by hotographers that pletures may be known by hotographers that pletures may be apparatus. Lay a coin, like a half dellar, on a plate of glass, and let a few sparks from an electric machine allo out. Homove the coin and the glass is evident, for it cannot easily be ruthed off.

If a plece of photographic paper takes the place of the glass, it will have the imprilat of the coin made uson it. It is not needful to have the sparks fall upon the coin, for if it be enclosed in a dark box, brought near to an electric machine allon of the coin made uson it. It is not neelful to have the sparks fall upon the coin, for if it be enclosed in a dark box, brought near to an electric machine allon it. Hemove the coin is a plate of plate is an electron make the waves of the coin made uson it. It is not neelful to have the sparks fall upon the coin, for if it be enclosed in a dark box, brought near to an electron machine having the coin made uson it. It is not neelful to have the sparks passing between its knobs, the place of the glass

Not much has yet been done in this direction, but it is a new clue to chemical possibilities, and one may confidently look forward to the time when the qualities and colors to surfaces of many things will be changed to suit the taste by an application of electric waves of satisface length to bring about the proper chemical reactions, and an electric machine may become a necessary adjunct to the apparatus of the photographer."

It is plain from this statement that the results of Prof. Röntgen were proved and given to the world in May, 1802, by Prof. bolicar, though this results without the ried of a Crookes the but strapply by the separating of an ordinary state electrical machine in the atmosphere, and in parfect darkness.

Prof. 19thour's method was: A static machine whose search represented some where in the sequence of the profession of feel must be done by rays which will penetrate flesh and in parfect darkness.

Prof. 19thour's method was: A static machine whose search represented some where in the sequence of the profession of the profession was planed on the top of his operations as sevent was planed on the top of his operations.

Similar to that used by Prof. Dolbear in engraving the coloron the glass.

Wood and human flesh are perhaps more easiis penetrated than many other materials, and
thin plates of metal offer very little resistance to
the passage of the ether waves, but the imjortance of Prof. Dolear's experiment, and
the later ones of Lenard of the Prussian
Academy in 1803, and Roomgen lies in the
actual application in photographic work of
certain wave lengths that have existed since the
first electric snark was made and perhaps since
first electric snark was made and perhaps since first electric spark was made and perhaps since the sun itself first shone upon the earth. They may be called "radiant heat" or "cathode rays." but they are simply ether vibrations lying outside the violet and red rays of the spectrum, and hence not visible to the human eye.

Robert F. Annau, an apparently well-to-do Scotchman, 30 years old, who says he is making a p casure tour of the United States, was taken id on the Chicago train which arrived at the Grand Central Station shortly after 6 o'clock

He was removed to the Grand Union Hotel, but they refused to receive him until a doctor cert fiel that his complaint was not contagious. Ir. Billings of lexington avenue examined him and reported to the pance that he had measies. Mr. Ahhan was removed to the Willard Parker Hospital in Sarteenth street.

An Electrical Test on the Elevated.

The Electric Storage Battery Company of Philadelphia has obtained permission of the Executive Committee of the Manhattan Railway Company to make an experimental test of it mature on the branch of the elevated railroad from Third avenue to the Thirty-fourth street ferry. This fact has given rise to rumors, which were circulated in Wall street yesterday for stock-jobbing purposes, of a deal between the General Electric, the Storage Battery, and the Manhattan Railway companies.